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USSR Report

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No. 502

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This serial report contains information on the development and productivity of the automotive and tractor industry; chemical industry and chemical machinery output; electronic and precision equipment; metallurgy and metalworking equipment; construction equipment and building materials.

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METALWORKING EQUIPMENT

AUTOMOTIVE AND TRACTOR INDUSTRY

EXPERIMENTS ON USING HYDROGEN AS VEHICLE FUEL

Moscow ZA RULEM in Russian No 3 signed to press 29 Jan 1979, pp 14-15

[Article by I. Varshavskiy, doctor of technical sciences, professor, honored figure of science and technology, RSFSR, I. Bershova: "Hydrogen Fuel - Searches and Experiments"]

[Text] Among the problems being solved in the world of motor vehicle building today one of the most pressing and difficult is the development of a motor vehicle which emits only slightly toxic exhaust and is at the same time economical. Ideally it should have "clean exhaust" and burn a fuel which is as economical as it can be compared to petroleum. The complication here is that such a simply formulated requirement has obvious contradictions.

In recent years the technical, urban development and hygienic moves in the struggle for clean air have more precisely formulated the search for a new type of fuel of non-petroleum origin which would be suitable for utilization in internal combustion engines. In other words, the problem of the "clean vehicle" has been transformed into a problem of energy sources. Researchers are more frequently turning to hydrogen, on which great hopes are placed today.

Hydrogen technology and hydrogen power engineering are being more persistently discussed today for the reason that this chemical element is the basis of the only fuel now known which, upon combustion does not form the notorious carbon monoxide and is therefore the least harmful ecologically. In addition its reserves in nature are practically inexhaustible. This is why for many years now attempts have been made to use hydrogen for internal combustion engines. Back in the 1930's the Moscow Motor Vehicle Mechanics Institute, the MVTU [Moscow Higher Technical School imeni M. E. Bauman] and a number of other institutes were working in this direction.

During the Great Patriotic War the idea of hydrogen fuel was applied to vehicles and anti-aircraft defense forces on the Leningrad front.

In post-war years in our nation Ye A. Chudakov and one of the authors of this article, I. L. Varshavskiy, used hydrogen to run a single cylinder engine at the USSR AN [Academy of Sciences] Motor Vehicle Laboratory. Academician V. B. Struminskiy and other researchers were also involved in this. However, these experiments were not on a wide scale. In recent years they have become more pressing and have been up-dated. In the U. S. alone, in 1975, there were 15 experimental design groups involved in research on this subject. They have developed 42 different types of "hydrogen" engines. Specialists are working on similar research in the FRG and Japan.

Great interest in hydrogen as a fuel is not only due to its ecological advantages, but also to its physical-chemical properties: its heat of combustion is twice as high as for petroleum products and the inflammability of mixtures with air have a wider range. Hydrogen has a higher rate of flame expansion and a low ignition point - 10-12 fold lower than gasoline.

In our nation extensive work on the use of hydrogen in motor vehicle engines is being actively conducted at many scientific centers, the efforts of which are coordinated by the USSR Academy of Sciences.

A method of obtaining this chemical element with the use of so-called energy accumulating substances (EAS) has been developed in detail by the Ukrainian SSR AN Institute of Machinery Building Problems, which is also conducting fundamental research on processes of burning hydrogen air and hydrogen gasoline mixtures and developing basic power systems for vehicles using various methods of storing the new fuel in the vehicle.

As a fuel hydrogen has several special characteristics. The wide limits of combustibility permit better regulating the engine operating process. As a result it is possible to increase fuel economy during partial loads - conditions which motor vehicle engines (experience) quite often. The heat value of the homogeneous mixture of hydrogen with air is lower than for gasoline. Therefore the power of a hydrogen engine depends on the method of fuel mixture more than does a gasoline engine.

KHADI [Khar'kov Highway Institute] and the Ukrainian SSR AN Institute of Machine Building Problems are completing research on the explosion resistance of gasoline hydrogen air and hydrogen air mixtures. As a result it has been shown that the tendency of such mixtures to explode depends to a considerable extent upon the coefficient of excess air. In utilizing hydrogen as a fuel other characteristics different from gasoline have been found. A study of engine operation using hydrogen air and gasoline hydrogen air mixtures has shown the high stability of the operating process. In comparing the limits of changing the optimal ignition advance angle during operation on hydrogen and gasoline one notes that in the first case it depends substantially on the coefficient of excess air. In using enriched mixtures the best angle of advanced ignition is decreased. Therefore during operation on hydrogen the engine requires other regulators of this parameter.

Finally, upon combustion of hydrogen the gases formed do not contain such harmful components as oxides of carbon, hydrocarbons, and oxides of lead. There is only one toxic component in the gas - oxides of nitrogen (and these to a lesser extent than when operating on gasoline). When hydrogen is used as an additive the content of harmful components is sharply reduced thanks to complete combustion. In addition it is less necessary to use harmful antiknock lead additives in gasoline.

Experiments have shown that internal combustion engines can successfully operate both with pure hydrogen and with a hydrogen and gasoline vapor mixture. Curiously even a 10 percent (of the mass of the fuel consumed) addition of hydrogen can have a substantial influence on reducing the toxicity of exhaust gases and improving the economic indicators. It somewhat expands the inflammability range of the mixture. This creates conditions for efficiently regulating the combustion process. In practice this means that it is possible to have stable operation on very low poor gasoline hydrogen air mixtures with a large coefficient of excess air, thus ensuring considerable savings in gasoline. In view of the fact that in city conditions engines operate up to 30 percent of the time in neutral or under incomplete loading, one can imagine the economic advantages of utilizing hydrogen. Engine operation with high coefficients of excess air result in almost complete combustion of the mixture, and consequently there are no toxic components in the exhaust gases.

Motor vehicle power plants operating on hydrogen fuel have already been developed at the Ukrainian SSR AN's Institute of Machinery Building. They obtain hydrogen water (with the use of EAS based upon metal oxides) and also from hydrides - substances capable of absorbing hydrogen when cooled, and releasing it when heated.

It is necessary to bind hydrogen with hydrides for safety reasons, since when tanks leak it forms a mixture with air which explodes easily (recall the frequent accidents of dirigibles filled with hydrogen). Equally important is the fact that hydrides are a rational method of storing hydrogen on a vehicle because of their volume characteristics.

The general power plant system is as follows: hydrogen fuel obtained as a result of reactions between EAS and water is delivered to the engine by a feed system. Engine power is regulated by components feeding a reactor to release bound hydrogen. The power plant can have an open or a closed cycle. In the first instance only storage capacity for the EAS and water are on the vehicle and the products of combustion are released into the atmosphere. In a closed cycle there is also a heat exchanger and condenser to condense water vapors from the exhaust gases. The water entering the EAS is then again used as a fuel for obtaining hydrogen. In such a closed cycle the "carrier" fuel is water and the energy is the EAS. In both cycles hydrogen fuel can be utilized in a pure form or as an additive (5 - 10 percent by weight). In the latter case the vehicle has a system for gasoline supply.

The hydrogen is extracted from the water in a reactor containing EAS. A constantly operating reactor is the simplest. In this the pressure is maintained by regulating the supply of the components to the reaction zone. The process of obtaining fuel is not instantaneous since there is a certain inertia. The hydrogen extracted from the reactor therefore should arrive at the engine through a regulator reducer maintaining the optimal pressure in front of the injector.

The system for using EAS based on oxides of metal developed at the Ukrainian SSR AN's Institute of Machinery Building Problems was installed in a Moskvich-412 and one using hydrides in an VAZ-2101.

The first experiment - using the Moskvich-412 (figure 1) was conducted by the engineers A. Baykov and V. Zhurman. The gasoline supply system was left unchanged. The machine has two reactors /1/, to obtain hydrogen, and a reducer /5/ intended for measuring out the fuel under various engine operation conditions.

Рис. 1. Установка с применением ЗАВ для питания двигателя водородом: 1 — реакторы периодического действия; 2 — бак для воды; 3 — кран подачи воды в реактор; 4 — блок насосов с электроприводом; 5 — редуктор в системе подачи водорода.

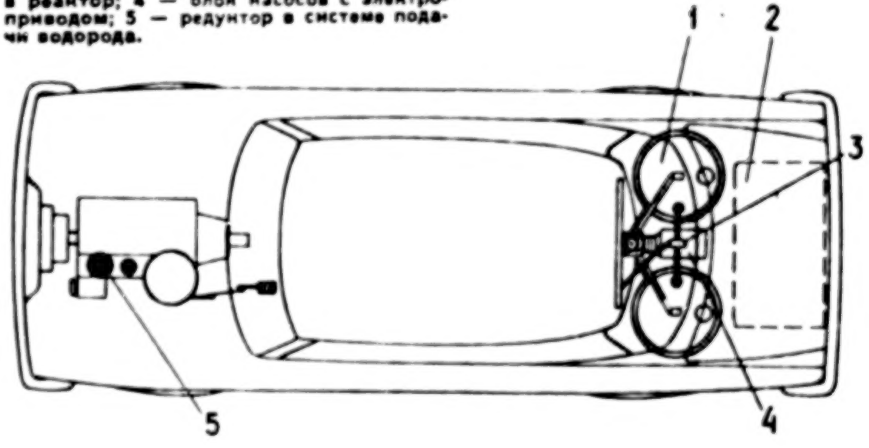

Diagram 1. Device using energy accumulating substances to supply engine with hydrogen:
1 - Periodically operating reactor; 2 - Water tank; 3 - Cross over supply line for water; 4 - Electric pump assembly; 5 - Reducer for hydrogen supply systems.

The periodically operating reactor has constantly loaded EAS based upon silicon or aluminum with a regulated water supply. The high pressure water pumps /4/ driven by electric motors supply water from a tank through a heater and filter to the reactor where it is atomized by the injector sprayer. Non-return valves are installed in the water system to prevent hydrogen from entering it if the water supply is halted. In addition there is a connector line /3/ which connects the supply of water from one reactor to another. All units in this experimental installation are mounted on a common frame and installed in the luggage compartment.

Water from the reactor enters the connecting line installed on the instrument panel. The driver connects the working reactor /1/ to the hydrogen supply system. The latter consists of a step down reducer, a moisture separator, a gas meter and a hydrogen supply reducer (controlled by a special pedal). The fuel is pumped through the supply line directly to the intake valves.

The VAZ-2101 vehicle (Figure 2) was equipped for operation on hydrogen obtained from hydrides. It was developed by candidate of technical sciences A. Mischenko. The hydride tank was developed by engineer V. Stepanov. The Zhiguliys retained the gasoline supply system and in addition a system for storing and supplying hydrogen was installed. It consists of a hydride tank /1/, heated by exhaust gases, a reducer with a fully variable vacuum regulator /9/ of the consumption of hydrogen and a mixer /8/ based upon a series produced carburetor. The speed of extracting hydrogen from the hydride system is regulated automatically (control block /10/, pressure relay /2/, a damper with electromagnetic drive /7/ on the exhaust pipe). This maintains hydrogen pressure in the system independent of engine conditions. During charging the hydride tank is cooled by water.

Work on the use of hydrogen was first extensively presented at the All Union Scientific Conference (Protecting Air Sheds from Pollution by Toxic Emissions from Transportation Equipment) in 1977. Its participants were then able to make a detailed acquaintance with vehicles operating on hydrogen additives. These machines underwent testing for many months on the streets of Khar'kov.

One and a half years have passed since then. A Volga has been added to the "hydrogen" Khiguliys and Moskviches. Recently a preliminary cycle of testing on this automobile was completed. It works on a gasoline hydrogen mixture. Specialists have no illusions: they face much work, in view of the insidiousness of hydrogen, its explosiveness and low specific weight, requiring large hydride tanks on board. So far the supply of hydrogen in such tanks is only sufficient for 100-12 kilometers if the engine is operating on hydrogen. If hydrogen is used as an additive the vehicles can run 400-500 kilometers. Nevertheless Academician V. P. Barmin and a number of other specialists feel that an engine operating on hydrogen is no longer a fantasy. The Khar'kov vehicles operating with a hydrogen additive have become a serious transition stage in these searches. They are considered both as a real "bridge" to the

development "hydrogen" vehicles, that is those operating on this fuel alone. Thus, machines with the inscription "Clean Air for the Planet" have run their first hundreds of "clean" kilometers on the streets of a large city. It is necessary to solve several problems involving the storage of hydrogen on a vehicle.

Research is continuing.

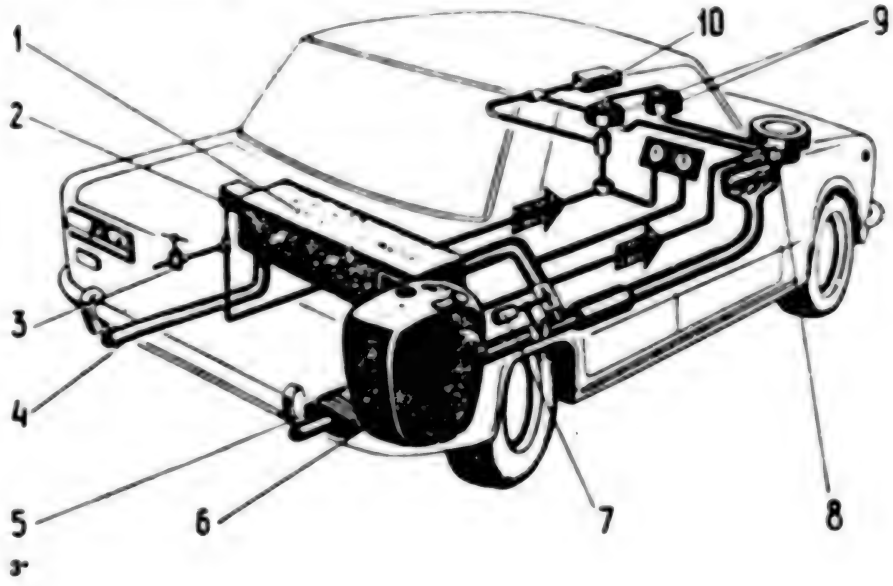

Diagram 2. Device using hydrides:
1 - Hydride tank; 2 - Pressure control; 3 - Filling valve; 4 - Exhaust pipe of hydride tank; 5 - Muffler; 6 - Gasoline tank; 7 - Damper electromagnetic drive; 8 - Mixer; 9 - Hydrogen pressure and consumption regulator; 10 - Electronic control block

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CSO: 1821

CHEMICAL INDUSTRY AND RELATED EQUIPMENT

REPORTS BY REPRESENTATIVES OF THE GEORGIAN CHEMICAL INDUSTRY

Tbilisi ZARYA VOSTOKA in Russian 13 Jun 79 p 2

[Article: "A Branch With Great Expectations: How Can Scientific and Technical Progress be Realized in This Important Branch and What Must Be Expected in the Future" (Passages Enclosed in Slantlines Printed in Large Type)]

[Excerpts] /V. Adbadze, Assistant Director of the Scientific Research Institute for Economics and Planning of the National Economy Attached to the Georgian SSR Gosplan; Professor/

Introduction of progressive methods of organizing production and labor is an effective way of increasing labor productivity and production volumes in the chemical and petrochemical industries. Here there exist great possibilities for reducing the numbers of industrial production personnel. For example, it is not surprising that the initiative to produce more products with a smaller number of workers originated at the Shchekinskiy Chemical Combine and received the name of the "Shchekino Method." In 12 years the Shchekinskiy Chemical Combine has increased the production volume nearly fourfold, freeing more than 1500 persons.

Nevertheless it must be stated that in the enterprises of the republic, with perhaps the exception of the Rustavskiy chemical plant, only timid steps have been taken in this direction. Full utilization of existing production capacities has still not been achieved. As a result, the output-capital ratio in the chemical and petrochemical industries of Georgia are lower than the mean branch level for the country.

There are a number of reasons for this. One of them is the presence of a large number of obsolete and worn out equipment in the enterprises. Thus, at the Rustavskiy chemical fiber plant it comprises more than two-thirds; at the leading enterprise of the production association "Gruzpolimerkonteyner" it is nearly one-third. This is equipment which is more than 10 years old, which is old for a branch where the process of renovation should be continuous.

A second point is the necessity of exactly coordinating capacities so that they often are dependent on each other. For example, because of a shortage in ammonia at the Rustavskiy chemical plant the output capacity for mineral fertilizers are only 70 percent utilized. This imposes great responsibility on the planners and builders, from whom efficient planning and timely implementation of all objectives is required. Unfortunately, assimiliation of capital investments in the fields of chemistry and petrochemistry is still being unsatisfactorily realized in the republic.

/T. Khazaradze, Second Secretary of the Rustavskiy Party Gorkom/

Two giants of the important chemical industry of Georgia are located in the city--a chemical plant and a chemical fiber plant. Here all the advantages of introducing new equipment and manufacturing methods and of expanding the range of production at the expense of products have been realized in full measure. For example, introduction of a plan for multi-step flushing out of the apparatus with ammonium sulfate, which obviates the necessity of completely stopping production, yielded a savings of R 630,000 for the chemical plant. Introduction of production of a staple fiber at the chemical fiber plant had an economic effect onthe order of R 1.5 million.

The chemical plant maintains close ties with the institutes of metallurgy and inorganic chemistry and electrochemistry of the Georgian AN [Academy of Sciences]. The start-up of a new potassium permanganate shop, for which development of Georgian specialist was assigned as its basic work, was a major event this year. Nonetheless, the collective still has much to do in order to increase the quality of mineral fertilizers.

One of the urgent problems of the enterprise is expansion of ammonia production. This year it is planned to nearly double its capacity. Accordingly it has been proposed to introduce projects for production of ammonium nitrate, nitric acid and others. There is no doubt that the timely introduction of these projects is a responsible task of the builders and the plant collective.

Matters are somewhat more complex with the chemical fiber plant. The enterprise long ago achieved the basic planned technological and economic indices; the collective has far exceeded the earlier established capacity. The number of personnel has been reduced. The result of work in the fields of strengthening industrial discipline, replacing and modernizing part of the equipment and increasing qualifications has had an effect.

Reserves of this sort, however, have their limits. Next comes reconstruction of the enterprise. It is being proposed to increase its capacity nearly 2.5-fold. But the entire rub is that the renovation plan is outdated. It is not designed for the long run. The design on which it is based and which is being applied in nearly all related enterprises no longer meets modern requirements and the tasks of the scientific and technological progress in the 11th and 12th Five-Year Plans.

Under these circumstances the specialists of the plant have evinced high personal interest. A more progressive design was independently developed and proposed. Contracts for the production of the necessary equipment have been concluded. The planners, however, are not hastening to introduce the changes in the plan, despite their advisability.

This once again confirms the necessity of more effective solutions of all controversial issues related to technologies in so rapidly improving a branch as the chemical industry.

/Z. Kadzhaya, Chief Engineer of the Kutaiskiy Industrial Rubber Products Plant/

The modern chemical industry's great demand for new, progressive forms of organization for production and, as a first-order priority, for modern economic and mathematical management methods and for electronic computer technology is great.

Thus, our plant today is manufacturing 80 million pieces carrying, 800 brands a year. It is not surprising that the distribution of operational information about the fulfillment of the daily schedule for output of finished products takes us a lot of time. In addition a large volume of work falls on the workers of our marketing division--for our products are sent to more than 700 users at different ends of the country.

We keenly feel the necessity of planning and applying automation of management in such subsystems as technical and economic planning, technical preparation of production, its operational planning and accounting, material and technical supply and marketing of finished products.

This will make it possible not only to reduce the work force and to alleviate the work of the administrative and management apparatus but it will also make it possible to obtain rapid and precise information about the economic activity, and that means to reduce the reserves of commodity stocks and finished products in warehouses, to lower the proportion of goods not paid for by users and to cut down on uncompleted construction.

The installation of electronic computers and introduction of ASU [Automated Control Systems] is envisaged only toward the end of the next five-year plan after expansion of the plant's fourth section. Apparently this question requires a more effective solution.

/E. Gventsadze, Director of the Batumskiy Oil Refinery/

The specialists of the Rustavskiy All-Union Scientific Research Planning and Construction Institute for Automation of Production Processes in Industry have carried out interesting work for us. They have developed an automated gasoline mixing station which includes an automated control

system for this process and for optimization of mixing. Construction of the station is nearing completion. Preliminary work on calculating the optimal mix is already being carried out on the "Minsk-32" electronic computer of the Georgian Maritime Steamship Line.

An important factor in increasing quality is constant quality control at all stages of the manufacturing process. For example, introduction of absorption removal of oils from the "Radon" system at the installation made it possible for us to centralize quality control and regulation of the basic processes. Work in this direction is being expanded. Co-workers in the Central NII [Scientific Research Institute] of Complex Automation have given us support.

In a number of cases, however, we are experiencing an acute need for the scientists' help. It has been established that the reserves of low-sulfur oil in nature is decreasing. This is having an effect on the operation of our enterprise, on the end products of refining. The proportion of products with the mark of quality decreased from 47.1 percent to 43.5 percent. During the quarter this index dropped to 27.5 percent.

Moreover in the process of refining high-sulfur oil discharge of injurious substances into the environment increases.

Thus, the need for radical reconstruction of the plant has emerged. And this problem can be solved only with the sicentist' active help.

/G. Tsitsishvili, Director of the Institute of Physical and Organic Chemistry of the Georgian AN; Academician of the Georgian AN/

The problem of oil refining is becoming increasingly urgent for the republic in connection with the discovery here of oil fields. This is one of the promising directions of the development of the branch. In connection with this a number of laboratories of our institute are conducting research involving the determination of the material composition of Georgian oil.

Important tasks also exist in the matter of chemization of agriculture. Here it is a question not only of mineral fertilizers but also of different preparations for control of harmful plants, artificial supplements to mixed feeds, etc. All of these are substantial factors in the intensification of agricultural production. Our collective is carrying out some studies in collaboration with the Georgian affiliate of the All-Union NII of the mixed feed industry and the Transcaucasian Zonal Experimental Station on Industrial Agriculture.

Refining of secondary material is acquiring enormous significance under modern conditions. This is important not only for more rational utilization of material resources bur also in terms of environmental protection.

For example, it is possible to obtain different types of fuel, materials for construction needs and artificial fertilizers from domestic wastes. And all this within the range of the possible for chemistry.

Finally, chemical polymers are irreplacable in many branches of the national economy. Scientists are in a position to control their properties. Thus our polymer laboratory is engaged in creating thermostable and mechanoresistant polymers, developing special materials characterized by so-called tropicresistance.

All this indicates the favorable outlook for the branch.

/P. Metreveli, Supervisor of the Technical Department of the "Gruzgornokhimprom" Production Association/

As our collective's practice indicates, the scientific institutions are always ready to collaborate with production workers. It is necessary only to display genuine interest and to create conditions favorable for the introduction of developments. In one of its issues ZARYA VOSTOKA covered in detail the work experience of the "Gruzgornokhimprom" association in the field of scientific and technical progress and the considerable results obtained from it.

Among the institutions associated with us by business contacts are five institutions of the USSR Academy of Sciences system two of the Siberian Section of the academy and the academic institutes of Georgia. This is a most significant point, since it is in these links that the direction of the development of sciences and technology is shaped for the long range. Meetings and conferences held at the association's base assemble as a rule 20-30 representatives of the country's research collectives.

Science is continually transforming itself into a direct productive force of society, and we are convinced from our own experience what advantages such an arrangement of affairs promises.

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CSO: 1821

BRIEFS

SYNTHETIC RUBBER SLOW--Yaroslav--The Yarkhimpromstroy general contract trust was to have made new capacities for production of synthetic rubber operational in April at the SK [synthetic rubber] plant. The startup, however, was disrupted, and today the lay-out of roads and access roads on the site has still not been completed. There is a shortage of pre-cast ferroconcrete, pipes and metal-rollers at the construction site. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 29 Jun 79, p 1] 9380

SYNTHETIC RUBBER--Tol'yatti--At the Kuybyshevskiy synthetic rubber plant a new complex for production of basic products of this preparation is being constructed. The five-month plan of the organization of the USSR Minmontazhspetsstroy has been overfulfilled. And yet the situation at this project, which should go into operation during the fourth quarter is disturbing. In the "BK-5" shop the Kuybyshevgidrostroy builders have still not begun to prepare the foundations for the end industrial lines. In the refrigeration section three out of six foundations are ready. Only 109 of 488 units of industrial equipment have been delivered for the shop. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 29 Jun 79, p 1] 9380

LIQUID PARAFFIN PLANT--Kirishi--The collectives of trust no 46, Glavzapstroy, and the organizations of the USSR Minmontazhspetsstroy are successfully working on the construction of an installation for production of liquid paraffin of the Kirishinefteorgsintez association. The plan for construction and assembly operations for five months of the year has practically been fulfilled by all the organizations. The assemblers of the Spetszhelezobeton trust have completed the concreting of the 120-meter pipe of the furnace section of this installation, outstripping the schedule. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 29 Jun 79, p 1] 9380

ISOPRINE COMPLEX--Novokuybyshevsk--The year before last a complex for isoprine production was planned to be put into operation at the petrochemical combine, but it was not possible to start it up. A new deadline has been designated--June of this year. The general contractor, however--trust no 25, Glavsredvolzhskstroy--has still not completed the installation of the foundations under 47 units of the industrial machinery and has not turned over the "IP-3/5" compressor shop. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 29 Jun 79, p 1] 9380

CSO: 1821

EFFICIENCY OF CAPITAL CONSTRUCTION PROGRAM REVIEWED

Moscow TRUD in Russian 14 Jul 79 p 2

[Article by V. Dymshits, Deputy Chairman of USSR Council of Ministers: "Efficiency of Capital Construction"]

[Text] During the years of the five-year plans, capital construction in our country has been transformed into a large industrial branch of the national economy. Today there is not one area on the territory of our immense homeland in which construction has not been carried out. The country has truly become a gigantic construction site. More than 8 million workers are engaged in carrying out construction and installation work.

The Party and our Soviet people value highly the great work being performed by the builders, who are erecting new industrial and agrarian complexes, building cities and towns and transforming all of our land.

During a speech delivered before the November (1978) Plenum of the CC CPSU, the General Secretary of the CC CPSU and Chairman of the Presidium of the USSR Supreme Soviet, Comrade L.I. Brezhnev, stated that "Despite the fact that we often criticize the builders, it is only fair to mention the tremendous contribution which they are making towards intensifying the economic strength of our country."

During three years of this current five-year plan alone, capital investments were employed for placing in operation fixed capital valued at approximately 300 billion rubles. More than 700 large industrial enterprises, a large number of new departments and production efforts entered operations and approximately 6.5 million well organized apartments and thousands of schools, hospitals and childrens' pre-school institutes were built.

Last year the following large facilities were placed in operation: Blast Furnace No. 6 at the Lipetsk Metallurgical Plant, an "800" mill at the Orsk-Khalilovo Metallurgical Combine, the first phase of the Atommash Plant and hydraulic engineering units at the Sayano-Shushenskiy GES, the Orenburg Gas Complex and the Soyuz gas pipeline. A high rating was assigned

to the work performed by the collectives of builders, installers and operations personnel that succeeded in building and placing in operation, within a short period of time, large capabilities for refining petroleum at the Pavlodar Petroleum Refining Plant, for the production of phenol and acetone at the Ufa Plant for Synthetic Alcohol, phosphorus at the Novodzhambul Phosphorus Plant and many others.

Important ferrous metallurgy projects were placed in operation during the first 6 months at the Severnyy Mining-Enrichment Combine in Krivoy Rog and at the Cherepovets metallurgical and nitrogen fertilizer plants, the Krivoy Rog and Chernovets metallurgical and nitrogen fertilizer plants, the Krivoy Rog and Makeyevka coke-chemical plants, the Kemerovo and Rovno Azot associations, the Mozyr' Petroleum Refining Plant and capabilities for electric power stations in the light, food and other branches of industry.

A great deal has been accomplished. Nevertheless, the plan for placing underway projects in operation and also for the carrying out of contractual work is not being fulfilled completely. There is a noticeable falling behind in the carrying out of this important work.

During the November (1978) Plenum of the CPSU, Leonid Il'ich Brezhnev underscored the slow elimination of shortcomings in this important branch of the economy. In addition, he mentioned that the process of dispersing capital investments among numerous construction projects is not being halted, that unfinished construction work is increasing and that a large amount of uninstalled equipment is lying unused at the warehouses.

The construction and installation organizations, customer-enterprises and all of the ministries are obligated to draw practical conclusions from this strict and fair criticism.

The principal task consists of ensuring that underway projects for this year and the entire five-year plan are placed in operation. It should be borne in mind that the plan calls for the principal capabilities to be introduced into operations during the second 6 month period. The builder must complete and, together with the operations personnel, ensure the placing in operation of more than 13 million kilowatts of new capabilities at electric power stations: complete and place in operation large enterprises in ferrous and non-ferrous metallurgy, including for the processing and enrichment of ore at Krivoy Rog and facilities at the Kursk magnetic anomaly, coke batteries at Kemerovo, Zaporozh'ye and Avdeyevka, non-ferrous metallurgy enterprises at Krivoy Rog and in other regions throughout the country: to build more than 9,000 kilometers of oil and gas pipelines: to place capabilities in operation for extracting coal in the Donets Basin, Kuznetsk Basin and Kazakhstan and smelting more than 3 million tons of steel. Very great volumes of work must be carried out and the production of mineral fertilizers must be ensured and also in the light and food industry.

Many examples of good and harmonious work by the construction organizations could be cited, as they successfully carry out their tasks for placing production capabilities and projects in operation.

For example, the work carried out last year by Glavlipetskstroy and subcontracting organizations in connection with building a blast furnace for the Novolipetsk Metallurgical Plant was coordinated in an efficient manner with all of the schedule executive agents, close interaction was organized among those participating in the construction work, the material resources and equipment were concentrated and an efficient socialist competition was organized. As a result, the socialist obligations were successfully fulfilled: a blast furnace having a capability of 2.2 million tons of cast iron was placed in operation 2 months earlier than the established schedule, thus enabling the plant's metallurgists to smelt a considerable additional quantity of metal and the builders and installers -- to carry out their work and to place in operation not only the blast furnace but a number of other underway projects as well.

Creative collaboration between the builders, planners and customer in building the Krasnodar Heavy Excavator Plant is making it possible to find means for reducing the construction schedules and lowering labor expenditures by means of detailed and economically sound planning and organizational-technological solutions and for introducing more progressive industrial structures which exclude the use of "wet" processes.

Minneftegazstroy is introducing many new developments into the planning and engineering solutions for the construction of pipelines under the complicated conditions which prevail in western Siberia. This is promoting improvements in labor productivity and in construction efficiency.

Unfortunately, the work is not proceeding in this same manner at all of the construction projects.

Many construction organizations are working in a disorganized manner and failing to fulfill their plans. This is caused by shortcomings in the organization of construction production work, by weak planning and labor discipline and by unsatisfactory material-technical support for the brigades and sectors. The ministries -- customers and contractors -- are still only weakly coordinating and directing the efforts of all of the collectives participating in the construction work towards achieving the final goal -- placing fully completed projects in operation.

A check on the status of affairs and reporting data underscore the fact that at a number of underway projects the organizational work aimed at concentrating resources has still not been completed fully and this can disrupt the schedules for placing the projects in operation. For example, this applies to underway projects at the Krivoy Rog Central Mining-Enrichment Combine and the Kemerovo Coke-Chemical Plant, which are being erected by USSR Mintyazhstroy [Ministry of Construction of Heavy Industry

Establishments], to construction projects at the Permnefteorgsintez enterprise and the Nikolayev Alumina Plant, being built by USSR Minpromstroy [Ministry of Industrial Construction] and to underway projects at the Starorusskiy Plant for Chemical Machine-Building and the Altayskiy Tractor Plant, which are being built by organizations of USSR Minstroy [Ministry of Construction].

The construction of a number of underway projects of the light and food industry, being carried out by organizations of USSR Minstroy, has fallen considerably behind the schedule. The plans are not being fulfilled with regard to the construction of a knitted goods factory in the city of Artem in Primorskiy Kray, a porcelain plant in Pesochnoye Settlement in Yaroslavskaya Oblast and a milk plant at Kostroma. These construction projects have not been fully staffed with workers, the presentation of a front of work for the installers and other sub-contractors is being delayed and the level of work organization and mechanization is inadequate.

The task of solving the problems associated with the concentration of forces and material resources at planned underway projects for the second 6 month period will brook no delay on the part of the construction ministries, the USSR ministries for installation and special construction work and their organizations in the various areas. The productive summer period must not be wasted and sluggishness cannot be tolerated -- we must take full advantage of each and every good working day. The ministries must undertake efficient measures aimed at correcting the unfavorable situations at the construction projects concentrating forces at the underway projects and fulfilling the plans for placing capabilities in operation this year.

Thought must be given to developing measures and carrying out the work required for preparing all of the construction projects for autumn and winter operations.

Large supplies of uninstalled equipment are to be found at the construction projects and warehouses of customers. It must be installed and placed in operation as rapidly as possible. At the same time, the experience of last year as well as this present one reveals that a portion of the underway projects was not supplied, in a complete or timely manner, with the equipment and staffing items required. This occurred owing to the fact that individual suppliers failed to fulfill their contractual obligations and, in addition, it was also caused by insufficient operational efficiency on the part of the staffing organizations and customers. For example, owing to insufficient deliveries on the part of the Novokramatorsk plant of Mintyazhmash [Ministry of Heavy Machinery Manufacture] and the Syzran' Turbine Construction Plant of Minenergomash of conveyer lines, ore-grinding mills and crushing equipment, the placing of capabilities in operation at the northern and southern mining enrichment combines was delayed.

Moreover, this year these plants are again late in filling the orders submitted for construction projects of the ore base for ferrous metallurgy

and underway projects of power engineering. There have also been incidents of equipment delivery schedules being disrupted by certain enterprises of Minelektrotekhprom. They are failing to supply, in accordance with the established delivery schedules, such items as transformers, large electric motors, panels and control boards for priority power units.

The delays which the builders, installers and machine-builders are tolerating with regard to placing capabilities in operation are causing harm to the planned economy. For example, a delay tolerated by the builders and the Izhorsk plant with regard to placing a power unit having a capability of 1 million kilowatts in operation at the Novovoronezhskiy Atomic Station resulted in the additional expenditure of a considerable amount of liquid fuel at the thermal electric power stations. Enterprises of Minenergomash failed to supply adequate amounts of equipment for underway projects of certain hydroelectric power stations.

In the near future the machine-building ministries and their enterprises must fully complete their equipment deliveries, in the quantities required, for underway projects this year.

Owing to the especially severe conditions experienced last winter, the builders were not supplied with the required amounts of timber, metal, cement and crushed stone. At the present time, with the weather conditions favoring construction work, every attempt must be made to rapidly eliminate the lag that developed in material deliveries. The enterprise-suppliers and the organizations of Gossnab and the transport ministries must ensure that the builders are supplied with the required material resources, so that full use will be made of the summer period for carrying out the program of construction work for this year.

In discussing the need for supplying construction materials, we must not overlook the need for ensuring that they are utilized in an economic, rational and thrifty manner. Checks carried out at a number of construction organizations have revealed that uncontrolled expenditures of materials are still taking place, as well as breakage and spoilage of goods during storage and transport, violations of the expenditure norms and the release of critical materials on the side.

Strict order must be restored in this work and all materials must be used in an efficient and economic manner.

In addition to the building of industrial and agricultural projects, a number of other facilities must be built and placed in operation this year: more than 112 million square meters of housing space, schools for more than 1 million students, childrens' pre-school institutes for 568,000 pupils and hospitals for 57,000 beds. This is great and important work. The ministries, departments and construction organizations must introduce corrections to the

work schedules so as to eliminate the lag that developed during the first half of this year and furnish complete support for the construction of industrial projects as well as housing and cultural-domestic projects in conformity with the plan.

Special importance is being attached to organizing efficient operations and creating conditions for highly productive work by the builders. In the erection of plants, especially large ones, tens of construction and installation organizations are participating. The coordination of their operations, skilful administration and control over the fulfillment of the daily plans and tasks are of priority importance.

In the resolution adopted this year by the CC CPSU and the USSR Council of Ministers entitled "Measures for Further Improvements in the Training of Skilled Personnel and Retaining Them in Construction," the tasks and measures were defined for raising the skills of the builders, improving work organization and ensuring growth in labor productivity and improvements in housing-domestic conditions and in the working conditions for builders in carrying out their production work. This resolution revealed the concern of the party and government for further raising the material and cultural level of the builders and for growth in their professional expertise. One vital problem touched upon in this resolution was the need for extensive dissemination of the experience of economic accountability brigades and other leading work methods in construction.

Last year many of the construction organizations failed to fulfill their plans for increased labor productivity. The problem of growth in labor productivity is a many-sided one and particular urgency is being attached to it today. Quite often the construction work is started in the absence of proper preparation of the planning documentation and without testing the technology or plan for organizing the construction operations.

Situations in which roads are not installed in a timely manner or planning and the required preparatory work are not carried out are completely unacceptable. Violations of these elementary rules are occurring even at such a large construction project as the Chernopovets Metallurgical Plant. This factor, together with weak organization in improving the skills of newly arrived workers at the construction projects, represents one of the reasons why the tasks for placing projects in operation and the plans for contractual work and labor productivity, notwithstanding the availability of the required material-technical resources, are not being fulfilled.

The builders are submitting valid claims against the suppliers of construction structures and certain types of equipment. The reinforced concrete structures being supplied by many housing-construction combines and plants are being received before their surfaces have been finished off properly. Moreover, they contain projecting edges and considerable irregularities. Large expenditures of labor are required directly at the

construction sites if these defects are to be eliminated. Such practice must be eradicated in a decisive manner and every attempt must be made to ensure the delivery of structures which are accurate in terms of their dimensions and processed to such a degree that no further finishing off is required at the construction projects.

Nor can we accept a situation wherein the parts for various procurements are received on an individual basis and lacking consolidated plant assembly. This applies in particular to non-standard equipment. At the sites this work must be speeded up and this often causes more labor to be expended than that required for the items and parts to be prepared at the enterprises.

During the past few years, the Ministry of Chemical and Petroleum Machine-Building has organized equipment deliveries for a number of production efforts and plants in the form of complete technological lines for plant assembly operations. This positive experience must become a work system. All of the machine-building ministries and plant-suppliers must master this system as rapidly as possible.

A considerable reserve for realizing improvements in labor productivity is that of improving the utilization of mechanisms. At many construction projects the excavators, bulldozers and cranes are being operated for only 10-12 hours daily. A portion of the construction equipment and motor transport vehicles is not in working condition and quite often the motor vehicles are being employed without trailers.

It is known that the transporting of individual items and bulk freight in containers produces fine results. Nevertheless, use is still being made of manual loading and unloading procedures in the handling of bricks and bulk cement.

Although these problems may seem minor in nature, the solving of them will result in improved use of working time and an increase in the labor productivity of builders.

The leaders of construction projects, trusts and associations must focus special attention on the considerable losses in working time associated with idle time and absenteeism. Some administrative leaders are failing to undertake efficient measures aimed at strengthening labor discipline.

Special attention must be given to ensuring that the builders are supplied with good quality tools, both manual and mechanized. Enterprises of Minstroydormash [Ministry of Construction and Road Machinery Manufacture] and other ministries and departments and also local industrial plants engaged in the production of mechanized and manual tools, even such simple ones as trowels, hammers, shovels and brushes, must display concern for ensuring that these products are produced in adequate quantities and in a high quality manner. The level of labor productivity for the builders is dependent upon the quality of these tools. There is still a shortage of

mechanized tools and thus Minstroydormash must increase considerably the production of these tools. There must be organizations and workshops at the construction sites for ensuring that the workers are equipped with high quality tools and the means for having them repaired.

The all-union correspondence discussion, which reviewed a very important question "A Brigade Contract For Each Construction Project" on the pages of TRUD, is deserving of great attention. Based upon accumulated experience, numerous proposals were advanced for the extensive dissemination of this progressive method for organizing labor, which was initiated by heroes of socialist labor comrades Zlobin and Serikov and which is entering into more widespread use at the present time.

During the speeches which were delivered, emphasis was placed upon the fact that brigade economic accountability makes it possible to instill a communistic attitude towards labor in the personnel, it leads to the thrifty expenditure of material resources and it raises responsibility for the quality of construction work and for the final work results. The output of contractual brigades is higher and the production costs for work are lower than the average figures. Those participating in the discussion offered a number of proposals: the introduction of plans for organizing the work at all construction projects, network planning and control over the carrying out of such planning, the creation at the construction projects of services for engineering-technological completion for ensuring that the brigades are supplied with materials and hardware on a continuous basis, the establishment for the brigades of quarterly and annual work plans and tasks and increased responsibility at all levels of control for a construction project with regard to the observance of the economic accountability agreements. Proposals are also being submitted for improving the skills and training of brigade leaders, for simplifying the technical documentation associated with converting over to a brigade contract and for many other vitally important problems.

The ministries, territorial construction organizations, associations and trusts must undertake all possible measures to ensure the rapid utilization in practical work of the proposals introduced by the leading builders.

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The first 6 months of the fourth year of the five-year plan has ended. The most important period is now at hand for the builders and installers. For it is during this period that full use must be made of all available potential in order to recover lost ground, conform to the schedule established, implement strict control over the course of construction of underway projects and rendering effective assistance to the construction organizations in solving those problems concerned with ensuring that production capabilities and cultural-domestic projects are placed in operation in a timely manner.

There can be no doubt but that the builders, installers and workers attached to planning organizations and the industry of construction materials are doing everything possible to ensure fulfillment of the plan for placing underway projects and production capabilities in operation and in this manner they are making a worthy contribution towards implementing the plans outlined during the 25th CPSU Congress for communist construction during the Tenth Five-Year Plan.

7026
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ELECTRONICS AND PRECISION EQUIPMENT

PRODUCTION OF HOME RADIO-ELECTRONIC EQUIPMENT

Moscow SOVETSKAYA TORGOVLYA in Russian No 5, 1979 pp 43-46

[Article by T. Ostanovkiy, Candidate for Technical Sciences and Associate Professor for the Department of Marketing Industrial Goods at the G. V, Plekhanov MINKh [Moscow Institute for the National Economy] and L. Mityushin, engineer: "Today and Tomorrow for Home Radio-Electronic Equipment"]

[Text] The growth in production of goods for cultural and general usage, including radio-electronic items, is directed towards the solution of one of the main tasks of socialist construction -- insuring a significant increase in the material and cultural level of life for socialist people.

During the 10th Five-Year Plan the continued development of production is envisaged, as well as an increase in the technological level of all merchandise. During the 9th Five-Year Plan the output of articles intended for cultural and general usage was increased by 1.8 times, and the same growth is intended also for the 10th Five-Year Plan.

The level of technology for a number of durable goods, including also home radio-electronic equipment, grew significantly in recent years. Much can also be expected from new developments considering the achievements of science and technology, industrial practices and operations.

Alongside the expansion and updating of variety through the output of new types of goods the main problem is the improvement of their quality, reliability, durability, the organization of the output of fashionable products, design and modeling with improved consumer features and high esthetic characteristics.

In his speech at the November (1978) Plenum of the CPSU Central Committee, Comrade L. I. Brezhnev pointed out that the increase in production, expansion in variety and improvement in the quality of consumer goods remains as one of the key problems of the national economy.

The assignments for the 10th Five-Year Plan in this area were determined by the decisions of the CPSU Cental Committee and the USSR Council of Ministers, "Concerning the Development During 1976-1980 in the Production of Mass Consumer Goods and Concerning the Measures for Improving Their Quality" and "Concerning the Measures for the Continued Development of Products."

The measures for expanding the production of radio equipment, the improvement of their quality, the development of color television and their stereophonic radio broadcasting had great significance for the development in the production of home radio-electronic equipment.

The ever-increasing demand for these technically complex goods is evidence of the growth of the actual gains of the Soviet people in the satisfaction of their daily needs. The turnover for the group of cultural goods is constantly growing: providing at a rate per 100 families for radio receivers and combination record players and radios, for example, in 1975 amounted to 77 units, televisions -- 71, recorders -- 16 which significantly exceeds the 1970 data and approximates the estimate established for 1980.

A significant improvement in the quality of home radio equipment allowed for an increase also in the export separate groups of these goods. For example, during 1970-1976 the export of televisions increased almost five times.

The improvement in the quality of home radio-electronic equipment is essentially the output of non-repairable articles or articles in which a high level of reliability is achieved, as well as the output of "basic models." The creation of these articles demands an especially high class of accuracy and a systematic approach to the assimilation of all that is new in radio electronics, and the utilization and mass production of standard and typical technological processes.

Analysis of the variety of home electronics equipment over a number of recent years attests to specific tendencies in its development:

the output of various modifications of receivers is growing significantly: during 1960-1970 it nearly doubled, and in the period 1970-1975 grew still another 70%;

the portion of color televisions within their total production is increasing and in the near future will reach approximately 65%;

the portion of radio receivers is growing because of the output of models for automobile and portable equipment;

the output of electric record playing equipment (EPU) and electrophones (EF), as well as portable recorders is increasing notably;

decreasing is the relative significance of items which require an electrical power source in favor of a growth in the output of models powered by autonomous electrical sources (batteries and accumulators);

the basic mass of radio receivers and combination record players and radios is output in classes II - IV, and at the same time the output of

these items in the highest and I classes, the demand for which is steadily growing, is still insufficient;

demand for portable casette and pocket recorders is developing; and

the demand for receivers and recorders for automobiles is increasing notably. The variety of these items still does not satisfy the demands made for them.

Progress in design concepts has been particularly noteworthy in the production of television sets. For television technology the principle of expanding the functions of the receiver unit was outlined and is being realized. A steady decline in the quota of black and white televisions is being observed. However, in our view, the output of black and white televisions within our country will justify itself for still several years until the problem is finally resolved for the introduction into production of color picture tubes which are more compact along the line from the screen to the throat, are cheaper (presently the cost of a picture tube amounts to 60-70% of the total cost of a television), as well as providing simpler control of the television and better image quality, while approching soft pastel tones in the color pictures.

The application of a number of devices which raise the convenience of operation is expanding. Within the high reliability of present-day televisions, nonetheless the malfunctioning of individual elements of the system has nonetheless not been eliminated. The rapid detection of a defect or its location within the system and replacement of the malfunctioning element is such a basic operational task. The development of component technologoy and new techniques as well as devices for the detection and elimination of defects will make available to maintenance men such capabilities as were totally unknown 10 - 15 years ago. Component technology for television (and not only television) is resulting in non-maintainable functional units, with a colored indicator for non-serviceable and serviceable, and maintenance is reduced to simply the replacement of the malfunctioning functional unit.

Important also is the task of developing individual power sources for portable units since their defficiency is restraining the output of small-screen televisions.

The general tendency in the development of home radio-electronic equipment is the transition from mechanical control elements to electronic, and from analog to digital systems which is inseparably connected to the component basis. An example of this is the use of integrated circuits, photo diodes, photo resistors and microprocessors with a tremendous degree of integration while retaining the smallest dimensions. Thus, an integrated circuit measuring 2 X 2 mm and which combines within itself all the functions of a medium band receiver is now already considered huge.

Recently there appeared and is now being realized the capability for creating mini-EVM [computers] for application in home radio equipment and use in microprocessors for receiver control. One may judge the degree of the

conversion of television elements if only by the fact that of all the electronic functions of a television the demand for semiconducting instruments and integrated circuits of various types now amounts to more than 80%, and electro-vacuum instruments (radio tubes) have been almost totally displaced from television circuits.

Marketing specialists, in our view, must take into account in their work the following important points in the output of televisions.

Dynamics of television output. The production of televisions within the country is steadily increasing and in 1979 more than 8 million of them will have been produced. Providing there is a supply of color picture tubes, the output of color televisions may amount to 65% of their total quantity, and the demand for color televisions within the country is practically unlimited.

Screen sizes and their relationship to the variety of televisions. The optimum relationship of televisions according to screen size depends on many technical, economic and social factors. Within the composition of domestic variety the prevailing size is a large screen. Thus, more than 30 brands of televisions are being produced with picture tubes of 60 cm and altogether several with smaller sized screens (50, 40, 32, 23 cm and smaller). The volume of output of tlevisions with small screens is also quite insignificant. At the same time, it is known, for example, that a television with a screen of 50 cm appeals to the buyers because of its convenient "comfortable" size. During 1980 more than 3/4 of the color televisions will be produced with picture screens of 61 cm. Such a distribution of models according to size, apparently, complicates solving the problem of a second television in the family. The fact is that for a long time there existed the opinion that the production of color televisions with small screens was inadvisable because of the difficulty in providing a high quality image. However, experience in the construction of televisions attests to the objective possibility for producing color televisions with a small screen. And this is connected to the placement of the television in an apartment. As experience has shown, a television with a large screen usually is installed in the general family rooms. To install televisions, however, in the bedrooms, childrens' rooms, kitchens and in the dachas models with smaller screens are required. There also exists a demand for portable televisions for out of city vacations, etc. Studying the demand for televisions with various sized screens would permit, although only to a limited degree, the solution of the question concerning how many and what size to produce in the future.

Types of picture tubes. The traditional picture tubes are still the most reliable and relatively cheap instrument for the reproduction of an image. But they have a number of deficiencies -- their bulkiness, adjustment complexity, susceptibility to external influences, for example, the Earth's magnetic pole, etc. Therefore, there is a demand for the application of new designs -- picture tubes with a planar arrangement of electronic cannons or single-beam color picture tubes. In picture tubes with a planar

arrangement of electronic cannons-projectors the latter are located not in the apexes of an equilateral triangle (delta-shaped configuration), but are drawn out into a single line. This solution has a number of advantages: the television circuitry is simplified, the number of electronic components is reduced, the quality of imaging and color transmission is improved, the screen field has uniform brightness at all points, alignment and tuning operations are reduced, the influence of the Earth's magnetic field is weaker and, importantly, the cost of the television is lowered.

Also television tubes with a so called two-dimensional screen (matrix) have been developed. This is principally a new solution based on gas-discharge panels using "liquid" crystals on thin luminescent film. According to their principle of operation these picture tubes may have a "memory" or be without it. The elements of several of these light only at the moment voltage is applied (they do not have afterglow), while others retain the image and "remember" it after removing the voltage. These are promising models of picture tubes which may introduce significant changes in the design and operating principles of televisions.

New elements in television sets. In addition to picture tubes of new design, within televisions we find the application of integrated circuits concentrated within the model, ultrasonic and infrared remote control, timing devices and others.

Particular attention is being paid at the present time to the development of various types of filters based on the utilization of surface acoustical waves which permits a sharp reduction in the size of the filters. A number of improvements is being introduced into all the new developments directed towards modernizing existing television models: auxiliary sockets for attaching a video recorder (input and output), and a television channel sensor control. With such a device only a light touch of the switching platform is sufficient for the instantaneous and noise free switching of programs. The need for mechanical switching devices which are subject to aging and wear and tear, as a result of which the reliability of the television is reduced, becomes superfluous. The transition from electromechanical to electronic tuning improves reliability to a significant degree not only in television sets, but also generally in any type of home radio-electronic equipment. The sensory switching devices, aside from the other advantages, saved the national economy a very significant amount of silver -- a rare metal for which there is practically no substitute.

In particular we should note the utilization within these items of light diodes -- transistorized instruments which feature the capability to create an optical mission of a well defined spectral composition by passing direct current through it. Light diodes are the primary components for electrooptical devices -- a new direction in electronics -- electrooptics, the applications of which in radio electronic equipment is practically unlimited.

Microprocessors. The application of integrated circuits in receivers because of their complexity led to the appearance of microprocessors -- programmable integrated circuits with the highest level of integration. According to their functional designation, microprocessors do not differ from EVM processors (the difference is only in size). Microprocessors consist of logic-arithmetic functional elements and control elements, an electronic memory device, and data input and output devices. Microprocessors of average complexity perform up to 500 and more commands in an assigned or logic sequence. In home radio-electronic equipment independent of its functional designation microprocessors may assume a large number of functions, for example, highly accurate electronic clocks connected to a timer device; the turning on and turning off of equipment at a prearranged time; the reception and recording of data transmitted by telephone; the reporting through a recorder to a telephone subscriber concerning your absence, the time of your return, where you are and when you will be there and so forth.

At first glance such a type of device may appear to be expensive. However, that is not so. On the market, for example, at a totally reasonable price there have appeared pocket electronic calculators which comprise conventional microprocessors linked with EVM. They greatly simplify mathematical calculations and computations. The most important task of microprocessors is the removal from the equipment of all mechanical control and alignment systems, because the main causes for failures and malfunctions in the equipment are these very movable devices -- springs, buttons, verniers, etc.

The cost of microprocessors over the next five years will be reduced by approximately 10 times, while at the same time their complexity will double every three years.

Inserts and TV games. Microprocessors have opened up the possibility for receiving on the screens of ordinary televisions totally new effects which have significantly broadened their functional purpose and have allowed, for example, the insertion of one television image onto another and the creation of home TV games on practically any subject. Thus, it is possible to receive the insertion of an "image to image" effect, that is the lighting up on the TV screen of a diminished or the full frame of an image which is being transmitted on other channels without interrupting the basic program to which the television is tuned at the given moment. This allows the TV viewers to see and know what is on the other channels at a given moment. The sizes of such frames are 16 X 18 cm and are normally placed in the corners of the screen. To receive an insert all that is necessary is to press one of the keys, and in so doing the channel number (of the program) for the insert lights up, and the sound accompaniment may be heard with the aid of a head phone.

Industry is already producing special accessories -- sets of TV games which are attached to the antenna junction of the television.

These accessories are based on microprocessors of various stages of complexity. The possibilities for interchanging sets of these TV games is unlimited (football, hockey, tennis, automobile racing, etc.). At the present time systems of TV games have been developed which preclude the possibility of repeating variants and automatically calculate the odds for the players. Mathematics and mathematics-graphics games which allow one to see on the TV screen a mathematical construction in graphic form which converts the television into an active teaching aid have begun to occupy a special place. Special design bureaus in Minsk and L'vov are busy developing accessories of this type.

In this manner, television functions are being significantly broadened, their operational reliability is being improved almost to the limit, and conditions and equipment are being created for the multi-functional use of televisions.

All of this results in the need to significantly increase the level of training for merchandising specialists and salesmen who are occupied with the acceptance from industry and the realization of radio technical articles. They should not only know well the new merchandise, but should know how to give the customer expert advice both concerning the technical aspects as well as instructions concerning the operation of the radio-electronic items.

In the near future the market will be saturated with new types of home radio-electronic equipment and everyone who is occupied with its reception and realization should be ready.

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ELECTRONICS AND PRECISION EQUIPMENT

OPTICAL COMMUNICATIONS

Leningrad LENINGRADSKAYA PRAVDA in Russian 17 Jun 79 p 3

[Article by Ye. Solomenko: "Light in Miraculous Threads"]

[Excerpt] During 1975, an optical, multichannel telephone and color television communications system, demonstrated at the VDNKh [Exposition of the Achievements of the USSR's National Economy] by the children of Leningrad scientists working under the supervision of Professor K. P. Yegorov, received very favorable comments from both Soviet and foreign specialists. Presently this collective of innovators, while breaking up, has become stronger and is continuiing in their initial direction under the initiative of a specialist well known in this area, O. I. Gorbunov.

This is certainly not the first year that the chair for Signal Transmission Theory and Nonlinear Electrical Circuit Theory of the Leningrad M. A. Bonch-Bruyevich Electrical Engineering Communications Institute [LEIS] has been occupied with these problems.

Such intensive interest on the part of scientists is understandable. In addition to the already named advantages, optical communications have still more significant pluses. In time light tubes made from inexpensive quartz will replace and supplant metallic cables and will permit the saving of many thousands of tons of copper, lead and other important, costly metals. Also, if an electrical cable intended for the transmission of a large volume of data will not tolerate a deformation and allows for only a very smooth deflection extending over a distance of tens of meters, then an optical light tube may even be coiled onto a small spool and bent at any angle. Its flexibility and small size permit the running of the light tube to places where metallic cable with a similar data capacity cannot be drawn: into a borehole, into a research bathysphere, etc. In so doing, interference from lightening discharges and magnetic storms are precluded.

And there is still another not insignificant circumstance. Today's communications systems are star-shaped: radiating from a common center are power lines which are then branched still further. If a route near the center becomes impaired, then an entire group of users are deprived of communications.

But for optical communications lines -- whether they are large, medium or small -- the light tubes are all of the same type and size, and therefore communications here are decentralized and its channels are totally interchangeable. In the event one of the communications routes becomes disabled communications with the subscribers is not lost, but assume other parallel lines.

In addition, the light tubes will be installed beneath the ground with consideration towards the future prospects, further development and growth in the volume of transmitted data: a wave guide, let us say, with ten optical filaments will provide the necessary communications for many years in the future. Is it necessary to say how disadvantageous and irrational it would be to lay out with such a supplementary reserve the prospect of ten lead cables with a copper "filling"?

All of these tremendous advantages tomorrow will cease to be a theoretical contribution and will begin to work for man and for our entire national economy. Toward that future day both scientists and specialists are laboring today. The staff of LEIS has developed the analytical theory and methodology for designing optical communications sytems for various purposes and is now using this in the actual development of equipment. Thus, assistant V. N. Goncharov has developed a light modulator -- an element which translates data into the "language" of optics. This modulator has already found a practical application. Many theoretical investigations have peen performed primarily in domestic but also in worldwide science.

Presently the chair's collective under the guidance of its leader K. N. Shchelkunov is heading the development and experimental testing of one of the variants of a 120-channel optical telephone communications line. In close collaboration with the specialists of the Leningrad industrial enterprises the scientists are making sets of equipment for this experimental line which in the near future will join the two Leningrad ATS [automatic telephone stations].

The volume of work is growing and also the range of subject matter is broadening. Now not one, but seven, chairs of the LEIS are conducting comprehensive research in optical communications under the guidance of the pro-rector for the Institute of Scientific Operations, Professor A. N. Rokhmistrov. But in order for this new orientation to be successfully developed it is of little value to develop its theoretical basis and create the necessary equipment. Most important is the training of highly qualified specialists -- active leaders for this orientation. For the first time in the USSR the LEIS organized the training and graduation of such personnel.

A new, promising scientific-technical orientation is coming to light. And tomorrow? In the opinion of many specialists optical communications are most fully pushing together radio communications and multichannel communications via electrical cable. On this operations will be based for telephone networks, communications systems and the control of ships, aircraft,

and industrial enterprises.

Light in contrast to radio waves penetrates under water well and is distributed in it, therefore the only form of open communications under water is optical. With the aid of a light beam one may probe the surface of the sea floor and map its relief; the accuracy of this technique will be significantly greater than with a sounding device. And hydrographics is only one of the numerous spheres where optical communications will uncover new enriched capabilities for the investigation and mastery of the world's oceans.

It is not difficult also to imagine a probe with a light guide providing a doctor with information concerning the condition of the internal organs of a patient. And the educational process, and cultural pursuits, and the sphere of life?

Geology and medicine, precision metal processing and instrument building, astronavigation and construction ... It is difficult to further enumerate all the areas where optical communications will lead tomorrow. It is this very same ray of light which is today beginning its run in the laboratories of scientists.

9082
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NEED FOR MORE HIGH-QUALITY STEEL FOR INSTRUMENT PRODUCTION

Moscow IZVESTIYA in Russian 24 May 79 p 3

[Article by T. Lapshova, Hero of Socialist Labor and machine tool operator, A. Zhilinskiy, Chairman of the Shop People's Control Group and Blacksmith, and Yu. Vesinin, Secretary of the Shop Party Bureau and electrician of the Tomsk Cutting Tool Plant: "An Acute Problem of Tool Sharpness"]

[Text] The authors of the published letter -- workers of the Tomsk Cutting Tools Plant -- raised the problem of increasing the output of high-quality steel. After all, the quality of steel determines the tool. The quality of the tool determines the strength of the machine tool. This also determines worker productivity and the final result.

Respect for metal among tool-making personnel is in the blood. Everyone knows and understands the price of steel. The welfare of the plant and of us ourselves depends on the extent to which we thriftily make use of the "bread of industry." The fraction of metal exceeds 60 percent in the cost of products. The average price of a kilogram is equal to the price of a kilogram of butter. Thus, wastefulness hits the plant very discernibly in the pocketbook. But carelessness is not only an economic concept. It is also no less a moral concept. He who is instilled with a strong working conscience does not waste a single piece of steel.

The performance of metal and its utilization factor are primarily taken into account when summarizing the results of the socialist competition. In the work circle his lot is hard who disrupts the technique, permits rejection and mixed chips of different marks.

A section on reprocessing wastes has been created at the plant. Its own metallurgy has appeared for resmelting wastes. Entire

tools for woodworking and some other products are produced from them. The saving is measured in additional real products rather than in specific tons. During the last five-year plan, the plant manufactured products worth more than four million rubles from wastes and saved metal; therefore, the enterprise's profits also increased. The collective constructed a polyclinic and a club for children, a sports complex and apartment buildings with their own money. This is convincing unanimity of the interests of the collective and society.

Thus it was from year to year. And we would like that it always be so. However, the enterprise has been in a fever for 3 years already. Our stocks of special high-speed steel were reduced in March of last year by 5.7 percent. They then took an additional 405 tons. In exchange they gave advice -- change the plan for nomenclature. In other words, produce tools from low-grade carbon steels, although the customers are awaiting completely different products. It is understandable that the plans were corrected for the plant. Incidentally, they also did not provide carbon metal. Nevertheless, fines were levied on us (for what, one asks?!), although neither the customers nor the national economy had any profits from them.

Even if the metallurgists could explain our current difficulties, they would be unable to give a satisfactory answer: why cannot a shortage situation be foreseen? When there is a shortage of something, one must accurately count and seek ways of the most thrifty management. Do not seek ways singly, but by reporting along the entire production chain. It was emphasized in the decree of the CPSU Central Committee "On organizing and political work of the Chelyabinsk party obkom on saving ferrous metals at enterprises and construction sites of the oblast in light of the requirements of the 25th CPSU Congress" that a system of the strictest regime of economy and carefulness is required. It is unnoticeable in our branch. The weight of the deficit has been laid on the enterprises and that's it. Moreover, it has been laid on those enterprises which are struggling to economize. An even greater economy is planned for those who improve technology and seek reserves. The supply bodies have now also "been connected." They are still cutting the already reduced funds by 3-4 percent. This means that the more thriftily and carefully a collective works, the worse it will be for him in the new year. To what has this "competition" of the instances led? For our enterprise, economy has ceased to be attractive and of interest. It scares one with its consequences. One must economize in response to levy sanctions. One must review the portfolio of orders and select more expensive and less metal-consuming products.

We have now gone only to a "conditional" saving. Everything looks quite decent in the summaries. The sales percentages are in place. The task on reducing raw material consumption has also been fulfilled in a way. The only thing missing is the necessary tools for the customers. The plant has not once appealed to Minstankoprom [Ministry of the Machine Tool and Tool Building Industry]. No one has refuted our calculations. But instead of help there was an amazing order. The carryover reserve of metal required for production rhythm has been cut in exactly half -- from 28 to 14 days. We seemingly have lost nothing -- the stocks themselves have not changed. But a reliable surplus saved us from lack of discipline of some metallurgical plants and from the consequences of some transport confusion. At the same time the conditions for delivery with their monthly responsibility remained as before. It is no secret that for small users, and we are related to them, metal is shipped only during the third 10-day period.

This order had a good purpose -- to force us to consume our reserves even more economically. They did not think everything over to the end. Losses resulted instead of a benefit. This was so obvious that nothing remained except to change the order and very quickly at this.

We shall not explain for long how the work with wheels is. The machine tools stand idle for days and they must be readjusted several times per day. Each readjustment resulted in wasted kilograms of metal. And as always this results in the same -- quality is lowered. Instead of economy there are losses of metal. This is the cost of the brief "office" experiment. For the first time in 17 years, the collective has not coped with the quarterly and 4-monthly plan on output of commercial products.

We appeal to IZVESTIYA on behalf of the plant collective. We were interested in a conversation begun by the newspaper in the article of Academician B. Paton "Thoughts About Metal" and developed by subsequent articles about increasing the output of high-quality steels. This discussion is extremely important for the tool builders of the country. After all, the quality of steel determines the quality of the tool. The quality of the tool determines the strength of the machine tool. This determines worker productivity and this determines the final result. There is an unbroken dependence here. The tool plants of the country require approximately 50,000 tons of high-quality metal. We are receiving it with great difficulty. It is understandable: the needs of all sectors of industry are increasing rapidly. But the resulting difficulties should be overcome in a more organized and well-thought-out manner. Why do the scientific research and design collectives and plants delay development and output of

new alloys instead of scarce alloys. We recently received a lot of steel with considerably reduced tungsten content. Industrial approval of it was not bad. The tools were reliable and productive. And experiments on new alloys have been conducted during the past few years. No sooner had we organized production than they stopped being delivered. What is the reason? Are there omissions in planning or a lack of desire to organize production of more economic metal? And after all it could remove the acuteness of the shortage.

The planning bodies answer the plant simply: there is no metal and there is no point in talking about it. But we feel that there is still something to reach agreement on. We refer once again to the decree of the CPSU Central Committee on the Chelyabinsk experience. Solution of the problem of more efficient use of metal in the national economy is still not at the center of attention of many scientific research and planning-design organizations, it is said in the decree. The tool industry is rather typical in this regard. A significant fraction of scarce and expensive steels now goes to chips. From the conversations, it is time for the ministry to actively convert to adopt nonwasteful techniques. The reduction of wastes in tool production by 20 percent would permit the sector to cope with the metal stocks allocated today.

Planning from that achieved and reducing stocks for metal from the level of last year gives no incentive for thrift. Let us make a comparison. A worker introduces an innovative suggestion, but he labors by the old norms for 6 months more. Everyone is confident of the intelligence of this approach. It should also be distributed to the enterprise as a whole. A plant that economizes on metal by new technical solutions should leave at least part of the saved steel for some time for its own needs.

And, finally, our last question: what practical results will discussion of the proposals advanced in the article "Thoughts About Metal" have? What do Gosplan, the Ministry of Ferrous Metallurgy of the USSR and the machine building ministries answer? We would like that specific measures be worked out which stimulate the struggle for efficient metal consumption.

6521
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METALWORKING EQUIPMENT

PROBLEMS IN THE APPLICATION OF NEW RESEARCH IN PRODUCTION

Kiev RABOCHAYA GAZETA in Russian 14 Jun 79 p 2

[Article by V. Popov, chancellor of the Zaporozh'ye Machine Building Institute imeni V. Ya. Chubar', doctor of technical sciences and professor: "A Plant for the Vuz"]

[Text] The vuzes of the republic have great scientific potential. They combine specialists of the most diverse fields of knowledge. This makes it possible to carry out complex investigations both in the field of fundamental and applied sciences and at their junctures at a high theoretical and experimental level. The vuzes could be much more thrifty with this potential!

Several organizations -- scientific research institutes, design offices and industrial enterprises -- usually participate in solution of important scientific and practical problems. The concentration of forces and funds helps to accelerate introduction and consequently to improve the efficiency of research. Reducing the periods of introduction saves funds and labor expenditures of scientists.

Here is a vivid example -- rapid application in practice of one of the investigations of our Department of Machines and Casting Production Technology and of the branch laboratory of the Ministry of Nonferrous Metallurgy of the USSR, carried out under the general supervision of Corresponding Member of the Ukrainian SSR Academy of Sciences, professor of the Zaporozh'ye Machine Building Institute Yu. A. Shul'te. Scientists have established that the cold brittleness threshold of steel casting may be reduced from -20 to -60 degrees Celsius. This means that the equipment will be capable of operating without breakdowns and shutdowns the year round, even in the most severe cold. New designs and alloys were developed for bits, protectors and

teeth of crushers. The production-repair base of an enterprise of Magadanskaya Oblast has begun to manufacture machine parts. This also made it possible to rapidly introduce the development into industry. During only one year, due to vuz science, the state saved 1,200,000 rubles.

Unfortunately, not every, even the most promising research, is put into production so rapidly. Extensive introduction of research is frequently delayed for reasons hardly dependent on the desire and efforts of the institute workers.

The greater part (80 percent) of scientific investigations is carried out by economic agreements with enterprises, academic and branch scientific research institutes. They provide a significant technical and economic effect. And research usually ends in manufacture of a pilot model of a product in the institute laboratories. These are either a new machine tool, instruments or a different device having higher characteristics or a new material with better properties. An industrial test is run under enterprise conditions. The tested model displays, let us assume, excellent results and receives a positive evaluation. This is recorded by the appropriate document. The authors of the developments write articles to scientific journals, compile applications for the inventions and quite deservedly receive authors' certificates and give reports at scientific conferences.

However, introduction of an innovation into production frequently stops at this. In order for an innovation to achieve wide application in the national economy, the interest of a specific ministry is required. The output of a new machine tool, device or material must be included in the program of some enterprise. And as is known, it has established the production plan of the product for the five-year plan. One can "squeeze into it" only if the plant is enlarged and is capable of producing some product above the previously given task.

However, this situation is hardly probable. If even very energetic people take on organization of industrial output of equipment or materials from the developments of an institute, even they expend five years, no less, on this.

Scientific workers of vuzes, evaluating the existing situation of things, usually do not take on such cumbersome and thankless work, select another interesting task and solve it in the vuz laboratories. The economically and technically advantageous solution is reduced to an industrial check. If it is successful, the corresponding document is created. As we can see, history repeats itself.

Can we get off of this merry-go-round? In order to more rapidly introduce the results of the labor of scientists and to increase the technical and economic effectiveness of scientific activity, the vuzes need their own experimental-industrial base and production of sufficient capacity.

There is the experience of cooperation of the Department of Equipment and Technology of Welding Production with enterprises of the pulp and paper industry at the Zaporozh'ye Machine Building Institute. Materials have been developed in the branch laboratory of the department for surfacing the parts of rotary feeders, which increase their resistance to corrosion-mechanical effects. A technique for surfacing rapidly worn-out parts has also been developed. A check showed that their service life is increased by a factor of 1.8-2.5 compared to the presently existing parts.

However, the welding materials proposed by the institute are not being produced. The Ministry of the Pulp and Paper Industry of the USSR planned to organize a section on manufacture of our materials at one of the enterprises. But it is not ready to produce welding electrodes and powder and composite wire. The welding materials needed for the branch may appear no sooner than 4-5 years later. Taking this into account, the institute has organized manufacture of surfacing materials in one of the laboratories of the welding department in a quantity which will meet the needs of the Segezha, Arkhangel'sk, Kotlass and Solombal'skiy Pulp and Paper combines and the Bratsk and Syktyvkar Timber Industry complexes. The annual economic effect comprised more than 200,000 rubles.

Experience shows that the operating properties of abrasive tools frequently do not correspond to requirements. Especially if it is manufactured to operate with materials which have a tendency to form microcracks, burnthroughs and other surface defects. The plants of the country are not at present producing abrasive tools with properties which eliminate these deficiencies.

An abrasive tool has been developed at ZMI imeni V. Ya. Chubar' that has increased capability of dissipating heat from the grinding zone. This would be suitable for the electronics, electrotechnical and instrument building industry. The use of these discs at one of the plants which produce transformers saved more than 500,000 rubles last year. Less electrotechnical steel is expended, the transformer parameters are improved and the consumption of electric power is reduced. The saving could be even greater if the institute had a section for developing the technology of manufacture and production of experimental lots of abrasive discs. The plants could be provided with the necessary quantity of tools until the new technology is developed. The periods of introducing the innovation would undoubtedly be reduced.

The presence of an experimental-production base is especially important for developments which it is not advantageous for specialized plants (the same abrasive tool plants) to develop due to the large variety of discs and their small number in series and planning of product output by tonnage.

There is also another side to the problem. The sphere of material production is now experiencing a shortage in the work force. Demographic forecasts are unable to indicate the time when it will be made up. Therefore, the wage fund allocated to each enterprise is not being completely utilized by its direct designation. And a large number of energetic work-capable young people are concentrated in the vuzes. Far from all students seek the opportunity of receiving some wage in our completely supported society. However, part of them are even so engaged in part-time work for different reasons. This is a sufficient reserve which could provide normal functioning of experimental production of a vuz. Thus, the enterprise could without any loss transfer to the institute part of the wage fund which it is not now using and cannot use in the near future. The experimental-industrial base would not draw the work force from the sphere of material production.

Expenditures for organization of experimental-industrial production of vuzes are repaid within the maximum shortest periods. The economic, scientific, technical and academic aspects of the feasibility of organizations similar to experimental-industrial bases of vuzes are obvious.

Further development of vuz science is related to the search and strengthening of new forms of creative cooperation with industry. The Academic-Scientific-Production Association Zaporozhets-ZMI is operating on public beginnings as one of these. Similar associations are also being created with other enterprises. The vuzes and enterprises are seemingly making steps towadd each other. But there will be no real approach until they become cost-accounting enterprises with the wage fund and with all the other rights of cost-accounting organizations. The management of the enterprise could then count this scientific-production association (NPO) as its own scientific research institute attached to the plant, and the institute directors, in turn, could count on a production base for scientific investigations, academic purposes and practice of students.

The advantages are obvious. Favorable opportunities are appearing for purposeful training of engineers for the enterprises combined into an NPO. The activity of cost-accounting NPO would bring in reserves for further increasing the level and efficiency of the academic and scientific work of vuzes. This would help

to form a contingent of students undergoing purposeful training from among candidates of production associations and graduates of the parent schools, to improve all types of practice according to the academic plan and to carry out course and diploma projects and scientific research work of students with participation of the association.

The effectiveness of vuz science, unlike the science of branch scientific research institutes, is measured not only in rubles. The rapid development of science in vuzes inevitably results in an increase of teacher qualifications. And this in turn determines the rise of the academic process to a higher level and gives rise to a creative situation at the institute in which the capabilities of the future specialists are fully developed.

The participation of students in scientific research and introduction of the results into production is a constituent part of nurturing persistence and purposefulness among young men and women in study and winning a solid life position based on unanimity of ideological-political, labor and moral education.

6521
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METALWORKING EQUIPMENT

PROBLEMS IN THE MODERNIZATION OF PUMPING STATIONS

Moscow PRAVDA in Russian 25 May 79 p 2

[Article by G. Novikov, engineer: "The Last Barrier"]

[Text] The artificial water circulation created by powerful electric pumps has almost the same significance to industry and agriculture as the natural water circulation has to nature. Moreover, one cannot but be alarmed by the circumstance that, despite the sharply increased scales of constructing water management objects, especially in melioration, the large pumping stations have remained almost the same as a half century ago in design and by the methods of construction. These are the same drained foundation area, massive reinforced concrete building, installation of equipment under the open sky and the same chairs of the operators with leaking walls and gates that don't close. Old equipment, almost not given to automation, forces one to maintain a staff of duty officers and people are working in oppressive air, noise and rumbling.

It is easy to imagine what it means to erect some reinforced concrete fortress with the height of a multistory house somewhere in the steppe that withstands Archimedes forces of flotation and water pressure from outside. And all this is only to enclose the pumps and motors from the water. But if one looks at the problem from the modern viewpoint, it turns out that a pump does not at all have to be protected against water from the outside since there is water inside it anyway, and the motor can be enclosed from the water by sealing the housing, which is incomparably less expensive than construction of the station building itself. Submersible pumps and motors are structurally combined into a monolithic unit capable of operating at the bottom of a reservoir.

We have similar units in the country that have been operating for 60 years and have shown good results. [illegible]mersible one-piece

electric pumps with the same productivity are half as heavy and more compact that "dry-land" pumps. Complete assembly and checking are carried out in the plant shop rather than on the construction site; therefore, installation requires only several days or even hours. The efficiency of the new pumps is appreciably higher than the old ones. The system of auxiliary equipment is simplified considerably, total automation is achieved and duty personnel are relieved. A new quality appears -- station mobility. If necessary it can be transferred rapidly to a new location.

The main advantage is to do away with construction of machine buildings and to convert to total plant manufacture not only of pumps but of unit blocks as well. This alone reduces the cost of construction by a factor of 2-3. Thus, we are talking not about partial improvement, but about fundamental restructuring of machine water lifting on a modern technical base with a saving of hundreds of millions of rubles.

Despite the fact that the given idea did not occur on a blank space, it was preceded by the advances of our and foreign hydroelectric engineers who created new units and encapsulated pumps had to pass over many obstacles during the 1960's. At that time there was the opinion among the "top developers" that vertical axial pumps are ideal in all respects. "To develop submersible one-piece electric pumps makes no sense whatever," several scientists and managers stated. They did not believe that a sealed motor could operate reliably under water and they predicted that the tons of water passing through the unit per second would tear the seemingly fragile structure to pieces and would tear the unit from the pipeline and they stated that several grains of sand sufficient to destroy the shaft seals. Encapsulated electric pumps had to reject still tens of similar doubts on which the years past and wasteful efforts and funds were expended.

When it finally seemed in 1971 that nothing more was left than to sign an official report of the acceptance committee with recommendation of a test pump into serial production, new obstacles arose. The committee of Glavnasosmash [expansion unknown] wrote in the official report: "Accept the machine for serial production provided that delivery of complete sets of submersible motors by a specialized enterprise is provided." The members of the committee knew well that there was no such enterprise in the country and the problem of constructing it had not even been raised by the ministry.

Glavnasosmash deleted the plans of its own ministry and all promises to customers with the official report of the acceptance

committee. Correspondence between the two ministries has continued from May 1971 up to the present time. The machine builders are winning the consent of electricians to deliver them submersible sealed motors in complete sets with guaranteed dependability. The electricians are agreeing to deliver only the active parts of the motors, that is, the stator core with winding and a rotor without a shaft. Each ministry refers in this case to its own specialization. The list has continued for a little more than eight years, but things are not moving. It seems strange that specialization has become the last barrier in the ptth of progressive and highly efficient machines.

Any good matter can be brought to the absurd with a subjective approach and disregard of the results of practice. It was this that was the primary reason for marking time for many years in the history of submersible pumps. Without dealing with objective reality, the chief of the VPO Soyuznasosmash B. Pavlov, who is entrusted with conducting the engineering policy in the field of pump production, feels that submersible one-piece electric pumps have no future, that this trend will in the best case be a narrow path which can never intersect the main road and that there is absolutely no problem of fundamental restructuring of machine water lifting.

Under the pressure of customers and the flow of information about units produced by foreign companies, the machine builders have been forced to recognize the obvious -- the important national economic significance of submersible units, especially for melioration, construction and public facilities. Minkhimmash [Ministry of Chemical and Petroleum Machine Building] is now producing two types of encapsulated electric pumps in 200-250 units annually. But this is a drop in the bucket compared to the real need.

While the machine builders doubted, production of three types of submersible one-piece pumps for operation an abrasive media was developed and assimilated one after the other without fanfare and red tape at the Moscow Machine Plant, incidentally a former pump plant. Moreover, they were not talking here about agency barriers: the entire unit is being manufactured at the plant. Production has begun to flow and is well organized. As a result, the cost of electric pumps of the GNOM type with the mark of MMZ [Moscow Machine Plant] is considerably lower than similar products in Minkhimmash.

The Moscow Machine Plant is being expanded and, if the necessary equipment is allocated to it, will be able to produce 60,000-70,000 units annually. If real effective specialization is organizad, i.e., if delivery of the working members of pumps

and end seals from plants of Minkhimmash is organized and if the active parts of motors are organized from Minelektrotekhprom [Ministry of the Electrical Equipment Industry], then 100,000 units annually could be produced here, which would cover the needs of all sectors. The decision of the appropriate agencies on specialization of a given plant and creation of an SKB [Special Design Office] at it with good experimental base is required for this. Minenergo [Ministry of Power and Electrification] of the USSR cannot solve the given problem since specialization of MMZ in submersible electric pumps "is opposed to the specialization of the ministry."

Small GES were actually unprofitable with the hydroturbines of ordinary type which were produced during the postwar years in the country. But the situation will be changed fundamentally if production of submersible units is organized, for which it is unnecessary to construct expensive buildings and to maintain duty personnel around the clock. These machines can be installed with minimum expenditures both at existing and at newly constructed dams where the water is uselessly discharged the year round. There is no need to construct long lines of electric power transmission lines with branching of the electrical system. The units will operate in the automatic mode. Expenditures for their manufacture and installation will be paid within 1.5-2 years due to output of cheap energy.

The minor hydroelectric power engineering of our time is not a self-goal, but a proprietary attitude toward natural resources. Hundreds of dams are being constructed on rivers with regard to the enormous scope of reclamation construction and implementation of measures for environmental protection in our country. Millions of kilowatts of energy of discharged water are being wasted in the spillways of dams due to the absence of compact and inexpensive hydrounits, whereas they could successfully serve man. The problem of fundamental improvement of machine water lifting on a new technical base exists despite the statements of some shortsighted speciaiists and requires urgent measures. It is finally time to stop construction of castles for machines which they do not need.

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